



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHS AND PHYSICS

**UNIVERSITY EXAMINATION FOR:
UPGRADING MATHS**

AMA 1003 CALCULUS

**END OF SEMESTER EXAMINATION
DECEMBER 2016 SERIES**

TIME: 2HRS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of 5 questions.

Answer Question One And Any Other Two Questions. Do not write on the question paper.

QUESTION ONE (30MKS)

- a) Find the gradient to the curve $y = 2x^2 - x + 2$ at $x=1$ [4mks]
- b) Evaluate $\lim_{x \rightarrow 4} \frac{x+6x-2}{x-3}$ [3mks]
- c) Determine the maximum value of y if $y = -0.01x^2 + x + 10$ [6mks]

- d. Find $\int_1^2 (3x^2 + 4x - 2) dx$ [4mks]
- e. Find the equation of a normal to the curve $y = 2x^2 - 4x + 4$ at $x=1$ [6mks]
- f. find $f \circ g$ given $f(x) = 2x - 2$ and $g(x) = x^2 + 2$ hence find $f \circ g(1)$ [4mks]
- g. From first principles Evaluate $\frac{dy}{dx}$ at $x = 1$ if $y = 3x^2$ [4mks]

QUESTION TWO [20MKS]

- a. Find $f'(x)$ from first principles at $x = 2$ given $f(x) = x^2 + 2x + 3$ [5mks]
- b. A straight line passes through A(3 2) B(4 6) and C (1, y) find the value of y [5mks]
- c. Evaluate $\int_1^3 [2x + 4] dx$ [4mks]
- d. Investigate the nature of turning points to the curve $y = -2x^3 + 24x + 4$ [6mks]

QUESTION THREE [20MKS]

- a) Evaluate $\int_0^2 [2x + 3x^2 + 3] dx$ [4mks]
- b) Using the quotient rule evaluate $\frac{dy}{dx}$ at $x=0$ given $y = \frac{3x+4}{2x+2}$ [6mks]
- c. Determine inverse ($f^{-1}(x)$) of the function $f(x) = \frac{x}{2x+4}$ [6mks]
- d. determine the turning points of the curve $y = x^3 - 12x + 6$ [4mks]

QUESTION FOUR (20MKS)

- a. Given $h(x) = 3x + 4$ and $g(x) = 2x + 3$ find $g \circ h(x)$ and hence evaluate $(g \circ h)^{-1}(12)$ [5mks]
- b. Find the equation of a curve given that the gradient function of the curve, $\frac{dy}{dx} = 3x + 2$ and the curve passes through (2, 6) [5mks]
- c. Use Simpson rule to evaluate $\int_1^3 [x + 2] dx$ using $n=4$ [6mks]
Determine the error in c) [4mks]

QUESTION FIVE [20MKS]

- a) Find $\frac{dy}{dx}$ at $x=0$ given
 I] $y = (3x+4)^4$ using substitution [5mks]
 II] $y = \frac{3x^2+2}{x^2+1}$ Using quotient rule [5mks]

b) Evaluate I] $\int_0^1 [x + 2] dx$

[5mks]

II] $\int_1^2 4x^{-2} - 2 dx$

[5mks]